Satellites, Oceanography and Society

David Halpern
Earth and Space Sciences Division
Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109-8099, U.S.A.

Oceanography is a relatively young science, although the surface of the ocean has always concerned us in regards to trade and transportation, search and rescue, warfare, human explorat ion, and recreation. The first attempt to systematical] y examine the global ocean below the surface was made by H.M.S ***Challenger in 1872-1876.*** The oceans cover 71 % of the earth, and many large areas await to have a first-order description. That the surface of Venus is better mapped than the bottom of the ocean is a remarkable testament to the satellite-engineering establishment and to the opaqueness of the ocean.

Recentl y, interest in the ocean has included non-military and non-transportation societal issues associated with daily-to-centennial time scales. Three examples are 1-3 week ("medium range") weather forecasts (atmospheric blocking and front al s ystems), seasonal-to-intcmnnual climate forecasts (El Niño and La Niño), and decadal-to-centennial global change forecasts (global warming caused by greenhouse gases). For medium-range weather forecasts, knowledge of sea surface temperature is important. For seasonal-to-interannual climate forecasts, temperature and current within the upper 300-500 m and surface winds are important variables. For decadal-to-centennial global-change predictions of sea level and atmospheric temperat urc and precipitat ion, we require information about euphotic-zone biomass and thermohaline and flow characteristics throughout the ocean basins. The influence of ocean dynamics upon the atmosphere, terrestial ecosystem, and ocean fishery will be described.

Satellites, by their frequent coverage of the global ocean, have already reduced the u ncertainties associated with global ocean measurements, especiall y for sea surface temperat urc, sea surface height, surface wind components, near-surface layer biomass, and near-surfidce current. Some factors limiting accuracy will be discussed, For seasonal-to-centennial forecasts relevant to society, subsurface oceanographic knowledge must be attained. It is a tenet of faith that satellite measurements in association with coupled ocean-atmosphere general circulation models (GCM) will propagate information on ocean dynamics from the sea surface into the ocean interior. Results from a coupled ocean-atmosphere GCM will be described.